Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Guidelines for Evaluating the	)	
Environmental Effects of	)	ET Docket No. 93-62
Radiofrequency Radiation	)	

Motorola is pleased to submit these Comments in response to the Commission's proposal in the above-captioned proceeding.

Respectfully Submitted,

Donald L. Walker
Director, Technical Programs
Motorola
Government Relations Office
1350 I Street, N.W., Suite 400
Washington, DC 20005
(202) 371-6947

January 25, 1994

Table of Contents

EXECUTIVE SUMMARY

- The Standard adopted in 1992 by ANSI is sound and scientifically based, and is an appropriate choice by the Commission for the basis of its Rules.

- The Commission is the appropriate agency to promulgate Rules relative to radiofrequency equipment because of its relevant expertise. It is, however, useful for the Commission to consult other agencies with complementary expertise to assist in its determination of final Rules.

- As pointed out by the Commission, there are differences in the exposure limits prescribed by various standards above 3 GHz. As a matter of principle, the Commission should always give consideration to other credible standards when they are more restrictive than ANSI. In this proceeding, however, ANSI should serve as the foundation of Commission Rules because of its credence, and because the differences between ANSI and other standards are not likely to have a significant influence on Commission action.

- The exposure limits applicable to the "Uncontrolled Environment" should be applied to users of cellular telephones, as well as to any members of the general public who may be near radio transmitters.

Other similar services, such as a future Personal Communications Service, should likewise be included in the uncontrolled category.

Those users included within the FCC Part 90 Private Land Mobile Radio Services, however, with the exception of certain SMR users, should be governed by the limits applicable to the "Controlled Environment".

- The ANSI low-power exclusion provisions should be adopted by the Commission. It may be necessary in some cases, such as for cellular telephones, to routinely measure the Specific Absorption Rate (SAR) because the 2 1/2 cm spacing requirement for application of this exclusion is not met. However, this exclusion will be applicable to other radio types, such as those used in the Private Land Mobile Radio Services. The low-power exclusion applicable to the controlled environment should be applied to equipment used in these Part 90 Services.

- The ANSI exclusionary provision based on measurement of the SAR should be adopted by the Commission. Adherence to this provision should be reported to the Commission as part of the equipment approval process. It is recommended that the Commission require, as part of the transmitter type acceptance process, an affirmative indication of compliance on the application form. To assure the integrity of

SAR measurements, the Commission may wish to request, on a spot check basis, detailed information relative to the SAR measurement procedures and results associated with a given type acceptance application.

- Certain Services (eg. Parts 22, 90, 94 and others) are currently categorically excluded from routine environmental consideration with regard to radiofrequency exposure. The Commission should in this proceeding adopt these same exclusion provisions. Any future services, such as those which would be encompassed under Part 99 should also be categorically excluded.

- The National Council on Radiation Protection and Measurements specifies in its Report No. 86 certain limits of exposure for amplitude modulated radiofrequency carriers. The Commission should continue to monitor the research relevant to this particular form of modulation, and should take appropriate action in the future if it is warranted.

- The Commission should retain its current procedures relative to the amount of information required to be included in conjunction with a license application. It may elect, on a spot check basis, to request submission of additional information justifying a determination of environmental compliance.

I. INTRODUCTION AND OVERVIEW

Motorola has been actively and directly involved in the matter of the potential health effects of radiofrequency energy for many years. We have conducted our own and sponsored basic research into various aspects of this subject, particularly as it affects Land Mobile radio. It has been our ongoing goal to facilitate the safety of our employees as they work with radiofrequency sources, and of our customers as they use our radio products. We therefore welcome the opportunity to support the Commission's initiative to modify its Rules to reflect the newly adopted 1992 ANSI Standard.

The Commission is well-founded in its decision to use the ANSI Standard as the basis for its Rules. The 1982 ANSI Standard has served the public well in providing appropriate protection with regard to radiofrequency energy. The newly updated 1992 ANSI Standard will continue to provide the basis for safe use of the vast array of radio products which are becoming increasingly commonplace today. Motorola wishes to emphasize that the ANSI Standard represents a very credible standard for the Commission to use in this matter. This standard was developed by some 120 scientists, engineers and physicians, representing the Government, academia, and industry. Several hundred studies involving such subjects as thermal regulatory systems, blood-brain barriers, calcium ion efflux, and cancer were scrutinized by the relevant committees as they worked to

establish the prescribed limits of exposure contained in the standard. In short, ANSI represents one of the very best standards in the world.[1]

We also support the FCC as the appropriate agency to regulate the matter of environmental aspects of radiofrequency energy. It is true that other agencies may have more expertise than the FCC with regard to the "health science" details of this matter; however, the FCC has the necessary experience and expertise in telecommunications to most effectively oversee the actual implementation of those regulations which are necessary to protect the public and its licensees. Of course, the FCC should, as it is doing in this proceeding, base its Rules on the "health" standards of others, and should also solicit the input of other agencies with relevant expertise.

In its Notice the Commission solicits comments on the applicability of existing standards other than ANSI, such as those put out by the National Council on Radiation Protection and Measurements (NCRP) and the International Radiation Protection Association (IRPA). It points out that these other standards are in some cases somewhat more stringent than ANSI, particularly above 3 GHz. As a general principle, Motorola believes that it is always

---

[1] It is noted that a petition has been filed by Mr. Ken Holladay requesting prohibition of the sale of certain hand-held radios. This request seems to be based on his concern that using these radios may pose some risk. The ANSI Standard, however, serves as the foundation to resolve the concerns of Mr. Holloday. Thus his petition should be dismissed. A detailed discussion of this matter is contained in the Telecommunications Industries Association filing in this proceeding.

prudent to give consideration to all standards which are relevant and credible. In this case, however, the Commission is warranted in basing its Rules on ANSI, because this standard certainly represents a most credible standard, among others, and it is the most recent, thus reflecting the latest scientific findings, and the most comprehensive "input" available.

The Commission has raised a number of related and important matters in this proceeding which Motorola wishes to address. The ANSI use of two different environments, the controlled and the uncontrolled, with corresponding different permitted exposure levels, is somewhat subject to interpretation; we will put forth our recommendations on this matter.

The old and new ANSI standards contain provisions for low-power exclusions under certain conditions; we will express our views on some aspects of this matter. The provisions in the current Rules on Service categorical exclusion have been very appropriate and beneficial; we will discuss this very important matter. Finally, there are a number of other related issues which will be covered.

II. CATEGORIZATION OF LAND MOBILE USERS WITHIN THE CONTROLLED AND THE UNCONTROLLED ENVIRONMENTS

In its 1982 Standard, ANSI provided for only one set of exposure levels; the same standard applied to those considered to be "nonoccupational" as applied to people in an "occupational" setting. The 1992 ANSI Standard, however, makes provisions for two different sets of exposure levels. One is associated with the "controlled" environment, which involves the occupational, or workplace setting; in this environment people are generally aware of the presence of radiofrequency energy, and exposure is normally a concomitant of employment. The other set of exposure levels is associated with the "uncontrolled" environment, and includes the general public, where, in general, people are unaware of the presence of radiofrequency energy.

It should be recognized at the outset that the exposure levels associated with each environment are safe. As ANSI stated in its Rationale Section, "To some, it would appear attractive and logical to apply a larger, or different, safety factor to arrive at the guide for the general public." It also indicated in this Section that "When exposure is in a controlled environment, the scientifically-derived exposure limits apply. When exposure is in an uncontrolled environment, however, an extra safety factor is applied--" (emphasis added). As is indicated by these statements, the more stringent requirements of the uncontrolled environment were not adopted because of

any scientifically-based rationale. Moreover, as also indicated by ANSI in its Rationale Section, "No verified reports exist of injury to human beings or of adverse effects on the health of human beings who have been exposed to electromagnetic fields within the limits of frequency and SAR specified by previous ANSI standards, including ANSI C95.1-1982" (emphasis added).

With the above ANSI perspectives as a basis, let us develop an appropriate rationale for placing the various Land Mobile services into the controlled or uncontrolled environment categories. A fundamental difference between the controlled and the uncontrolled environments relates to the awareness, or knowledge of the people involved relative to the presence of radiofrequency energy in the environment. The ANSI definition for the controlled environment states: "Controlled environments are locations where there is exposure that may be incurred by persons who are aware of the potential for exposure--" (emphasis added); the corresponding definition for the uncontrolled environment states: "Uncontrolled environments are locations where there is the exposure of individuals who have no knowledge or control of their exposure" (emphasis added).

With a view toward differentiating the various Land Mobile services with respect to these points, the Telecommunications Industries Association (TIA) developed tables of characteristics which generally apply to the

Part 90 Services and the Part 22 Services.[2] Specifically, characteristics were shown relative to the types of people involved, the nature of the services involved, and the operational aspects associated with the services. We agree with TIA that these two services have many dissimilarities. The people who operate within a Part 90 Service may be quite different from those who operate within a Part 22 Service. The Part 90 Services are generally referred to as the "Land Mobile Radio" Services. In contrast, the major Part 22 Service is generally called "cellular telephone" by many of the people in the public who might use this service. Equipment used in the Part 90 Services is generally provided by and serviced by a radio users employer. Cellular telephone equipment, on the other hand, is often procured by the end user through a service provider or retail store. Furthermore, it is usually the responsibility of the cellular user to arrange for any required maintenance through the service provider or some other service shop.

The Operational characteristics of the two services differ materially. Some of the attributes of Part 90 operation are: radio user operates with a microphone and specially configured operating controls; operation is push-to-talk simplex in nature; user is part of a fleet, and should keep messages short in deference to others in the system who must also use the channel;

---

[2] Motorola was an active participant in the work of the committee which developed the TIA Comments, and supports them. We include herein, by reference, the various characteristics of the Part 90 and Part 22 Services as provided in tabular form in the TIA Comments.

user often must "compete" for airtime; user normally communicates with a radio dispatcher, who generally exercises an element of control over the channel use; each user is typically identified by a car or vehicle number, and sometimes may use radio call letters; user normally requires at least a minimum amount of training in the proper use of the radio equipment.

In substantial contrast to the above characteristics, a Part 22 user typically experiences the following: user operates with a wireline telephone-like handset with keypad; operation is full-duplex, ie. talk and listen at the same time without need for push-to-talk; user is unaware of others on the channel, and thus has no "peer pressure" to keep messages short; user normally communicates with a party in the wireline network--there is no dispatcher involved; each user is identified by a unique telephone number; user is unlikely to have any significant training in the use of the cellular telephone, which has been designed to provide characteristics of a wireline telephone.

As can be readily seen from the above discussion, the characteristics of the Part 90 Services are quite different from those of the Part 22 Service. Furthermore, we believe that the above-discussed attributes, along with the additional ones listed by TIA, will provide significant awareness to a Part 90 user that he/she is using a radio device, and that the radio is, in fact, transmitting radiofrequency energy. By and large, then, (with the exception

elaborated in the next paragraph) we believe that the above-discussed definitions for the controlled and uncontrolled environments apply appropriately to the Part 90 and Part 22 Services respectively. Also, because of similarity, Service Parts 94, 95, and appropriate portions of Parts 21, 74, and 80 should also be included in the controlled environment category; likewise, Part 99 should be considered to be in the uncontrolled environment.

It can be argued legitimately that certain Specialized Mobile Radio (SMR) users may not as clearly "qualify" for the controlled environment as the rest of the Part 90 Service users. Specifically, this is true for those SMR users who are similar to cellular users, both by virtue of the nature of their use of the communications, and particularly because of the equipment that is used. The Commission may wish to consider including those SMR end users who utilize telephone-like equipment in the uncontrolled environment. For the purpose of distinction, the following definition could be used to identify this telephone-like, hand-held portable equipment:

> A self-contained unit with transceiver, keypad, and antenna as a singular device, which is configured like a wireline handset (to be held beside the head with a speaker at the ear and a microphone piece at the mouth), and designed to be used for full duplex (simultaneous talking and listening) interconnected landline conversations. It functions like a wireline telephone.

Motorola believes that SMR users who employ the above-defined hand-held equipment are best encompassed within the ANSI definition for the uncontrolled environment. Thus, the Commission would be warranted in categorizing this particular class of SMR user as uncontrolled. We note, however, that those SMR end users who employ dispatch-type radio equipment, (ie., the hand-held radio is used directly in front of the face) should be included in the controlled environment, because the above-described attributes for Part 90 users apply.

Finally, with regard to the controlled vs. uncontrolled matter, we note that the Commission has indicated in its Notice at Footnote 16 that portable hand-held radios may be included in the uncontrolled environment unless the users are "aware of the potential for exposure as a concomitant of employment". On the basis of the above discussion we believe that all Part 90 portable radio users, with the exception of the specific just-discussed SMR's, have the requisite awareness or knowledge to be properly included in the controlled environment. The fact that a person operates within the framework of the characteristics discussed above for Part 90, and thereby has a multitude of opportunities to become fully aware that he/she is using a radio device which transmits a "signal", should form the basis for inclusion in the controlled environment; the fact that a portable radio is being used should not, of itself, be a determinant in this matter.

III. USE OF LOW POWER DEVICE AND SAR EXCLUSIONS

The 1982 ANSI Standard contained exclusionary provisions for low power devices such as Land Mobile portable radio units; exclusion could be based upon either the radio power output or upon SAR measurements. The Commission, in turn, adopted these same provisions in its Gen. Docket 79-144 Report and Order. The 1992 ANSI Standard likewise contains these provisions, but with certain modifications. The Commission is proposing in the instant proceeding to again incorporate these provisions into its Rules.

Motorola enthusiastically supports the use of both of these exclusionary criteria as a basis for establishing adherence to the ANSI Standard. These criteria, along with the others prescribed by ANSI, provide a basis for safe use of electromagnetic energy. The low power provision, particularly, is also very useful to all involved parties, because it is administratively simple and easy to explain to radio users who are not skilled in the details of electromagnetic energy. It is straightforward and convincing, and most importantly correct, to be able to tell a customer that the portable that he/she is using is "safe" because both ANSI and the FCC have determined that the power level is sufficiently low that it "automatically" meets the safety protection criteria.

In some cases, portable units may not be accommodated within the provisions of the low power exclusion. It is, however, still possible to

establish adherence to the ANSI Standard by measuring the SAR. Although the process of measuring SAR is certainly more complex than simply determining the transmitter power output, it nevertheless is a useful and sometimes necessary alternative way to establish that the radio fully meets the requirements of the ANSI Standard. We would like to discuss certain aspects of each of these exclusionary provisions in the following paragraphs.

The low power exclusion was limited to frequencies below 1 GHz in the 1982 ANSI Standard. The 1992 Standard extended this limit up to 1.5 GHz. It is understood that these limits were based on the simple fact that supporting data was not available to justify higher frequencies than these. There was no fundamental scientific rationale which limited exclusion to these particular frequencies.

Motorola would like to put forth a recommendation which can enhance the utility of the low power exclusion, and which can benefit all concerned parties. New Personal Communications systems are expected to exist in a relatively short time, and will operate at a frequency as high as 2.2 GHz. Also, even higher frequency spectrum may be made available for Land Mobile use as a result of the Federal Government initiative to provide about 200 MHz of spectrum for private sector use, which could be as high as 5 GHz. Thus, it would be very useful if the ANSI frequency limit were to be extended to encompass these future situations. Specifically, the FCC may

wish to request ANSI to develop the necessary experimental data which may justify extension of the low power exclusion up to 5 GHz.

Further with regard to the low power exclusion, this ANSI provision does not apply if the radiating structure of the radio is maintained within 2.5 cm of the body. This limitation, while appropriate for powers that approach the limits prescribed by ANSI, may not be necessary for some, yet to be determined, lower power. It is possible, for example, that the powers associated with the new PCS Service may be sufficiently low that even with the radiating structure of the radio placed directly on the body, the requisite criteria justifying a low power exclusion would still be met. The Commission is urged to support and facilitate the necessary effort to develop and adopt this additional exclusionary provision. Clearly, it will be very beneficial in the future as PCS and other low power new services come into being.

Motorola has been measuring the SAR of its portable radio units for a number of years, and has established that SAR measurements are soundly based and useful.* TIA in its Comments indicates that it would be useful to develop a standard for measurement procedures and test site construction

*Overview Comments on our work are contained in Section V E. of this Filing; details are contained in Appendix E.

which has been approved by an appropriate body; it indicates that it is willing to facilitate this activity through its accredited ANSI process. Motorola concurs that this would be useful, and will support such an effort.

Finally, we wish to reiterate here, as discussed in the previous section of this filing, that the exclusionary provisions for portable hand-held radios should be based upon the service in which they are used. Specifically, portables used in the Part 90 Services should be regulated under the limits applicable to the controlled environment.

IV. CONTINUATION OF THE SERVICE CATEGORICAL EXCLUSIONS

As a result of its proceeding which addressed this matter in 1985, the Commission concluded that the Land Mobile Services, by and large, should be categorically excluded from routine environmental processing requirements with regard to radiofrequency energy. Specifically, Service Parts 22, 90, 94, and 95 were excluded, as were appropriate portions of Parts 21, 74, and 80.

These categorical exclusion provisions have been very beneficial to many interested parties. The Commission has benefitted because this action has negated the filing of unnecessary paperwork, thus lightening its administrative workload. The Commission's licensees and manufacturers have benefitted for the same reason. Additionally, these later parties, as well as radio end users, have been well served because the Commission, by taking this action, has sent a credible message to Land Mobile Radio Service users that they can use their equipment, when following manufacturers recommendations, without significant concern about its radiofrequency exposure safety. As discussed in the previous Section on low power exclusions, people can readily understand and have confidence in an expert Federal Government determination that given equipment and installations are sufficiently likely to be safe that it is unnecessary to routinely scrutinize them.

It is worth noting that there have been millions of Land Mobile transmitters operating for many years with an untold number of operating hours, without any credible showing that any harm has ever been caused to human beings from the associated radiofrequency energy exposure. On the basis of this "fact", and the points discussed below, Motorola believes that the Commission continues to have a sufficient basis to categorically exclude the Land Mobile Services as it did in its 1985 proceeding.

As a starting perspective, we put forth the premise with regard to Land Mobile operation, that nothing has really changed, in essence, from the time of the Commission's 1985 proceeding. As a matter of fact, it can be argued that the basis for categorical exclusion today is even better than it was in 1985. It is recognized that the 1992 ANSI Standard is in some ways more stringent than the 1982 standard. However, from the point of view of assuring adherence to these standards, it is, as described below, as easy, if not easier, to determine that the relevant ANSI provisions will be met today compared to the past.

The following discussion will be generally divided into two parts: equipment and installations involved in the controlled environment, as exemplified by the Part 90 Services; and equipment and installations in the uncontrolled environment, as exemplified by the Part 22 service. It is useful

to focus upon the specific type of equipment involved in given situations. Thus, we will discuss, first for the Part 90 Services, base station installations, mobile installations, and portable use situations.

Base station installations anticipated for use today and in the foreseeable future are not significantly different than those that have been used over the past many years. Many of these installations are of relatively low power. However, there are some provisions in the Commission's Rules which permit a power level of up to 3500 watts ERP (for example, for paging systems in the 900 MHz band). It should be recognized that a power level this high has been permitted and used for some time. Specifically, the Rules have permitted Land Mobile operations in the 450 MHz and lower bands to operate with a transmitter power output of 350 watts. Furthermore, the Commission does not regulate the gain of the antenna that can be used with these transmitters. Therefore, as an example, an antenna and transmission line with a net gain of 10 used in conjunction with a 350 watt transmitter, would result in an ERP of 3500 watts. This situation might occur in either the widely used 150 MHz or 450 MHz bands. Thus, the powers which might be used today are really no different than those which have been authorized and in use for some time.

Although we indicate above that the use of high power Land Mobile installations is relatively unchanged today compared to the past number of years, it is nevertheless useful to quantify the separation distance from these

installations required to adhere to the ANSI Standard. As shown in the last section of the main body of this filing, with additional detail in the Appendices, this distance is indeed modest, even for the highest permitted powers. The largest separation requirement is less than 4 meters, and this is for a yagi (directional) antenna, an unlikely candidate for paging use. Use of a more typical omnidirectional antenna, with a comparable gain, would require a separation distance of less than one meter. Thus, achieving the requisite separations should not normally be difficult.

On a related matter, the Commission solicits comment upon the need for licensees to certify to the Commission those practices used at given radio sites to assure compliance with the ANSI Standard. It should be recognized that access to virtually all Land Mobile sites is restricted. It is in the interest of the site manager and the people who have installations on these sites to rigorously restrict access by unauthorized people to assure equipment security. Thus, relatively few people are even able to get near Land Mobile base station installations. This makes it relatively easy to prescribe and enforce work practices which assure adherence to the ANSI Standard for those few people who have a need to be in the vicinity of the equipment on these sites.

Motorola has, for some time, measured electromagnetic energy levels at relevant radio sites, including those shared with high-powered television stations, and has imposed appropriate work practices where needed. This,

we believe, has worked well. We will continue to carefully monitor and review those practices which are in place at relevant sites where we have equipment and personnel involved to assure that the ANSI Standard is met. We therefore see no need for the Commission to routinely require the submission of information in conjunction with each license application relative to radio site "safety". Rather, the Commission could, where appropriate on a spot check basis, verify that the proper procedures are in place to assure adherence to its Rules.

Although the above discussion is directed to the Part 90 Services, it also fully applies to cellular and paging base station installations regulated by Part 22. The same access limitations apply, as well as the use of work practices, to assure adherence to the ANSI Standard.

With regard to Part 90 mobile use, there has been no change in equipment or the relevant ANSI permitted exposure levels since the 1985 Standard. The same separation distances prescribed in our equipment instruction manuals that were used in conjunction with the 1982 ANSI Standard apply for the 1992 Standard.

The 1992 ANSI Standard as applied to Part 90 portable radio units, however, does differ from the 1982 Standard. Specifically, for the Land Mobile Services, the power levels which are permitted in order to qualify for

a low power exclusion are reduced for bands above 450 MHz. For example, the 1982 Standard permitted a power level of 7 watts at 900 MHz; the 1992 Standard allows only 3.5 watts in this band. This more stringent requirement has no practical impact, however, because existing (and, it is anticipated, future) 900 MHz portable radios have lower power levels than the requisite 3.5 watts. Thus, there has been no change, in essence, between the 1992 and 1982 ANSI Standards with regard to Part 90 portable radio units.

The above discussion focused upon the controlled environment, as exemplified by the Part 90 Services. The following will cover the uncontrolled environment, as exemplified by Part 22 Cellular Telephone Service.

Mobile units used in the Cellular Service have a maximum power of 3 watts. This is also true for transportable units. The associated requisite spacing to establish adherence to the ANSI Standard is only 10 cm. It is highly unlikely that anyone would even be within that small spacing from the antenna of either a cellular mobile or transportable unit; certainly, they would not be there for any significant period of time. Thus, the likelihood of any exposure exceeding the 1992 ANSI Standard is extremely remote.

With regard to cellular portable units, it is anticipated that the Commission might prescribe an appropriate regulatory procedure to assure compliance with the ANSI Standard (for example, as part of equipment authoriza-

tion). Thus, it would be established, as a matter of record, that each given cellular portable unit that is authorized for use in the Cellular Service does, in fact, adhere to the ANSI Standard.[3]

From the above discussion, it can be seen that the impact of the 1992 ANSI Standard, relative to the 1982 Standard, is minimal. Furthermore, the Commission can have an even greater confidence that Land Mobile users are not exposed to levels exceeding the ANSI Standard because of its equipment authorization procedure for portable units (assuming this is the procedure it adopts). On this basis, Motorola recommends that the Commission adopt the same Service categorical exclusions for the Land Mobile Services as it did in its 1985 proceeding in this matter. Specifically, Parts 22, 90, 94, and 95, and appropriate portions of Parts 21, 74, and 80 should be excluded; also the new Part 99 should be included in this exclusion category.

---

[3] This also applies, of course, to Part 90 portable radio units.